REMARKS

The Office Action of January 18, 2006 has been reviewed and the Examiner's comments carefully considered. The present Amendment amends claims 1, 5, 10 and 12. No new matter has been added. Support for these amendments can be found in the specification and drawings as originally filed. Accordingly, claims 1-13 are currently pending in this application, and claims 1 and 5 are in independent form.

Information Disclosure Statement

The Form PTO/SB/08 initialed by the Examiner and returned with the Office Action shows that the Examiner has drawn a line through the reference titled Chemical Data Book 3 on Form PTO/SB/08, indicating that the citation is not in conformance and has not been considered. A telephone call was placed to the Examiner on February 6, 2006 to determine why this reference had not been considered. The Examiner indicated that the reference was not considered because no English-language translation or statement of relevance of this reference was provided. Therefore, Applicants enclose herewith English-language translation of the relevant portions of Chemical Data Book 3 along with another copy of our timely-filed Form PTO/SB/08. The Applicants' respectfully request that the Examiner consider this reference and return an initialed copy of Form PTO/SB/08 indicating such consideration.

35 U.S.C. § 112 Rejections

The Examiner has rejected claims 10 and 12 under 35 U.S.C. §112, second paragraph as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Specifically, the Examiner contends that claims 10 and 12 are indefinite because the units of "Φm" are not described in the specification nor are they conventional according to SI standards. The Applicants believe that the above amendments to claims 10 and 12 overcome the Examiner's indefiniteness rejections.

Reconsideration and withdrawal of these rejections are respectfully requested.

35 U.S.C. § 103 Rejections

Claims 1, 3-5 and 7-13 stand rejected under 35 U.S.C. § 102(a) as being unpatentable for obviousness over Japanese Patent Application Publication No. 09-211897 to Takiguchi (hereinafter "the Takiguchi application") in view of Japanese Patent Application Publication No. 02-000083 to Fujinaga et al. (hereinafter "the Fujinaga application") and further in view of Diamond, Arthur S., *Handbook of Imaging Materials*, pp. 214-222, 227 and 228 (hereinafter "the Diamond reference"). In view of the above amendments and the following remarks, the Applicants respectfully request reconsideration of this rejection.

As defined by independent claim 1, the present invention is directed to a carrier core material for an electrophotographic developing agent comprising ferrite particles. The ferrite particles contain a ferrite component represented by the formula $(MnO)_x(MgO)_y(Fe_2O_3)_z$ where x, y and z are each expressed in % by mol and are numbers satisfying the conditions of $40 \leq x \leq 60$, $0.1 \leq y \leq 10$ and $x+y+z=100$. The ferrite particles also contain ZrO_2 in an amount of 0.01 to 5.0 parts by weight based on 100 parts by weight of the ferrite component. The ZrO_2 does not form a solid solution with the ferrite component and the ZrO_2 is finely dispersed in the ferrite component. The carrier core material has a magnetization, at $1000(10^3/4\pi \cdot A/m)$, of 65 to 85 Am^2/kg and an electrical resistance, at an applied voltage of 1000 V, of 10^5 to 10^9 Ω.

As defined by independent claim 5, the present invention is also directed to a coated carrier comprising a carrier core material which comprises ferrite particles and a resin coating layer formed on the surface of the core material. The ferrite particles contain a ferrite component represented by the formula $(MnO)_x(MgO)_y(Fe_2O_3)_z$ where x, y and z are each expressed in % by mol and are numbers satisfying the conditions of $40 \leq x \leq 60$, $0.1 \leq y \leq 10$ and $x+y+z=100$. The ferrite particles also contain ZrO_2 in an amount of 0.01 to 5.0 parts by weight based on 100 parts by weight of the ferrite component. The ZrO_2 does not form a solid solution with the ferrite component and the ZrO_2 is finely dispersed in the ferrite component. The coated carrier has a magnetization, at $1000(10^3/4\pi \cdot A/m)$, of 65 to 85 Am^2/kg and an electrical resistance, at an applied voltage of 1000 V, of 10^5 to 10^9 Ω.

The Takiguchi application discloses an electrophotographic developing carrier produced by adding a capacitor component on the surface of magnetic carrier core particles having a ferrite component expressed by the formula $(Fe_2O_3)_x(A)_y(B)_z$ where A is MgO and B is MnO. Since the contents of MnO, MgO and Fe_2O_3 are described in weight ratio, the contents of these compounds in the present invention have been converted from molar ratio to weight ratio. The following table illustrates this conversion and also provides the contents of MnO, MgO and Fe_2O_3 in carrier core materials A and B provided in the Takiguchi application.

	Molar Ratio			Weight Ratio		
	MnO	MgO	Fe_2O_3	MnO	MgO	Fe_2O_3
Combination of upper and lower limits in the present invention	40.0	0.1	59.9	0.2287	0.0003	0.7710
	40.0	10.0	50.0	0.2528	0.0359	0.7113
	60.0	0.1	39.9	0.4003	0.0004	0.5993
	60.0	10.0	30.0	0.4504	0.0426	0.5070
Present invention	40.0 - 60.0	0.01 - 10.0	30.0 - 59.9	0.2287 - 0.4504	0.0003 - 0.0426	0.5070 - 0.7710
Carrier core materials A and B described in Takiguchi application				**0.22**	**0.18**	**0.60**

As is clear from the above table, the contents of MnO and MgO of the carrier core materials A and B described in the Takiguchi application are outside the range of the present claimed invention.

The specification of the present application describes that certain problems exist if the contents of MnO and MgO are outside the range provided by the present invention (see page 18, line 19 to page 19, line 10). For instance, if the content of MgO is excessive, electric resistance of the carrier core material becomes high, while magnetic properties tend to be lowered. This is considered to be one of the reasons that the carrier core materials A and B described in the Takiguchi application have a saturation magnetization of 58 Am^2/kg. This value is lower than the claimed range of 65 to 85 Am^2/kg of the present invention.

The Takiguchi application further describes that the carrier particles are formed by calcining. The Examiner contends that this would appear to give an oxidized surface to the carrier. However, as described on page 22, line 8 to page 23, line 1 of the

present specification, "the oxide layer" in the present invention is a layer having a high concentration of Fe_2O_3 other than a spiral structure in a thickness of several μm from the outermost surface of the ferrite carrier core material toward the center. Such an oxide layer cannot be formed by simple calcining as described in the Takiguchi application.

The Examiner further argues that because the ferrite of the Takiguchi application is a soft ferrite it would appear to have little or no residual magnetization or coercive force. Although the residual magnetization and coercive force of soft ferrites are lower than those of hard ferrites, it is a general event that even soft ferrites express residual magnetization and coercive force depending on the formula or the calcining condition. For example, Carrier 13 of comparative example 8 in the present specification had a coercive force of 25 $K/4\pi \cdot A/m$. Such a coercive force is outside the range of coercive force required by dependent claim 11.

Accordingly, although the Takiguchi application broadly discloses a MnO-MgO-Fe_2O_3 ferrite, the Takiguchi application does not teach or suggest the formula and contents of MnO, MgO and Fe_2O_3 capable of obtaining magnetic properties, electric properties and image properties which are achieved by the MnO-MgO-Fe_2O_3 ferrite of the claimed invention.

Furthermore, the Fujinaga application and the Diamond reference do not cure the deficiencies of the Takiguchi application.

The Fujinaga application is directed to a carrier for a dry two-component developer and is provided by the Examiner as a teaching of the addition of fine oxide particles, such as ZrO_2 particles, to the surface of the carrier to reduce the dependency of carrier specific electric fields and improved carrier fluidity. However, this reference further describes that sintering is induced between the carrier core particles and the fine particles of the insulating oxide (for example ZrO_2) by a heat treatment to stick the fine particles of the insulating oxide to the surface of the carrier core particles. Therefore, the dependency of carrier specific resistance on electric fields is decreased and carrier fluidity is improved.

The claimed invention, on the other hand, achieves high electric resistance of the carrier material while maintaining high saturation magnetization by fine dispersing ZrO_2 in the specific ferrite component without forming a solid solution with the ferrite component (see page 18, lines 4-8 and page 21, lines 10-24).

Even if ZrO_2 is present in the only surface of the carrier core particle as described in the Fujinaga application, it is not sufficient to achieve the high resistance of the carrier as required by the claimed invention because ZrO_2 is not present inside the carrier core particle. The high resistance of the carrier can be achieved by dispersing the ZrO_2 in the ferrite component as required by amended independent claims 1 and 5.

In addition, recent compact developing devices suffer from heavy developing stress. Accordingly, materials with sufficient durability must be used in their construction (see page 12, line 1 to page 13, line 7). However, sufficient durability cannot be obtained by the method of making materials comprising ZrO_2 on only the surface of particles as disclosed in the Fujinaga application.

Further, the specification of the present application also describes that the addition of components such as Li_2O, CaO, SiO_2, BaO and the like to the ferrite component to increase the resistance of the resulting ferrite is known (see page 21, lines 10-13). The Fujinaga application also discusses this aspect. However, the specification of the present application describes that if the components are added to the ferrite, they form a solid solution with the ferrite, whereby the electric resistance of the ferrite is increased but the magnetization thereof is lowered. For example, the carrier of comparative example 3, to which Li_2O was added, had a saturation magnetization of 54 Am^2/kg lower than that defined in the present invention.

The Fujinaga application fails to teach or suggest that the magnetic properties are deteriorated by inducing the sintering between the carrier core particles and the fine particles of the insulating oxide by a heat treatment to stick the fine particles of the insulating oxide to the surface of the carrier core particles as required by the present invention. Furthermore, the Fujinaga application also fails to teach or suggest the saturation magnetization required by the present invention.

Accordingly, even if the teachings of the Takiguchi application and the Fujinaga application are combined, the resultant carrier cannot obtain the high resistance and high magnetization at the same time because sintering is induced between the MnO-MgO-Fe_2O_3 ferrite core particle disclosed by the Takiguchi application and the ZrO_2 by a heat treatment to stick the fine particles of the insulating oxide to the only surface of the carrier core particles as described in the Fujinaga application.

The carrier of the present invention, however, has both high saturation magnetization and high electric resistance at the same time. This feature is obtained by fine dispersing an appropriate amount of ZrO_2 in the specific ferrite component having a formula limited to the range claimed in independent claims 1 and 5 without forming a solid solution with the ferrite component.

The Diamond reference is provided by the Examiner as a teaching of a ferrite carrier core with a magnetic saturation of 30 to 96 emu/g. The Diamond reference merely describes the range of saturation magnetization of a general ferrite, and does not cure the deficiencies of the Takiguchi application and the Fujinaga application described above.

For the foregoing reasons, the Applicants believe that the subject matter of amended independent claims 1 and 5 is not rendered obvious by the Takiguchi application in view of the Fujinaga application and the Diamond reference. Reconsideration and withdrawal of the rejection of claims 1 and 5 are respectfully requested.

Claims 3, 4 and 7-13 depend from and add further limitations to amended independent claims 1 and 5 or a subsequent dependent claim and are believed to be patentable for the reasons discussed hereinabove in connection with amended independent claims 1 and 5. Reconsideration and withdrawal of the rejection of claims 3, 4 and 7-13 are respectfully requested.

Claims 2 and 6 stand rejected as being unpatentable for obviousness over the Takiguchi application in view of the Fujinaga application and further in view of the Diamond reference as applied to claims 1, 3, 5, 8-10 and 12 above, and further in view of United States Patent No. 6,316,156 to Takiguchi et al. (hereinafter "the Takiguchi patent").

The Takiguchi patent is provided by the Examiner as a teaching of the addition of Bi_2O_3 to MnO ferrites to control the electrical resistance of the carrier. This reference discloses that if a predetermined amount of Bi_2O_3 is contained in the ferrite component, the electrical resistance of the carrier can be controlled to a desired value within a broader range.

Claims 2 and 6 depend from and add further limitations to amended independent claims 1 and 5. The Takiguchi application, the Fujinaga application and the Diamond reference were discussed hereinabove in connection with amended independent claims 1 and 5. The Takiguchi patent does not cure the deficiencies of Takiguchi application, the Fujinaga application and the Diamond reference. Therefore, claims 2 and 6 are believed to be patentable for the reasons discussed hereinabove in connection with amended independent claims 1 and 5. Reconsideration and withdrawal of the rejection of claims 2 and 6 is respectfully requested.

Based on the foregoing amendments and remarks, reconsideration of the rejections and allowance of pending claims 1-13 are respectfully requested.

Respectfully submitted,

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